Innovative Imaging Spectrometer Calibration Techniques

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A recent laboratory calibration of the Airborne Visible infrared Imaging Spectrometer (AVIRIS) provided an opportunity to experiment with several innovative calibration techniques. 'l'he objective was to develop techniques which (1) improved the accuracy of a calibration measurement, (2) provided independent checks for systematic errors, and or (3) reduced the time required to collect a calibration data set. In all cases, the techniques took full advantage of the. data collecting power of the imaging spectrometer and consequentially relies on the power of modern computers and data processing algorithms. The first set of techniques collected data to measured the system spectral response function. Spectral emission lamps and rare earth doped reflectance targets were used to provide a check on the channel-to-channel spectral calibration. A scanning monochromaterwas employed with a spectral sync signal and multiple grating orders passed to verify calibration between separate spectrometers. A Michelson interferometer was used to produce a wide range of channel spectra. New measurements of the spatial response function and spatial sampling interval were made using various forms of scanning spatial targets. A validation of the spatial sampling interval and scan uniformity was made using a low frequency diffraction grating. The absolute radiometric calibration was validated using (1) a cavity blackbody and (2) a direct view to a reflectance panel illuminated by a irradiance standard lamp. Radiometric linearity was validated using (1) a range of cavity blackbody temperatures, (2) a range of lamp current settings, and (3) a set of reflectance targets with a range of reflectivities. A proposed new techniques to measure polarization sensitivity and stray light will also be discussed.

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